Keeping Pesticides on Target

hen scientists in the ARS Appli-

cation Technology Research Unit at Wooster, Ohio, focus their technology, it's delicate crystalline shapes of pesticides that come into view.

A combination of high magnification, x-ray technology, and computer imaging software makes it possible for the scientists to see individual crystals of pesticides dried on the surface of a plant leaf.

Charles Krause, an Agricultural

Research Service plant pathologist, says the combined technologies—called electron beam analysis, or EBA-offer researchers a way to pinpoint precisely where pesticide products are going on the plant. Information from the closeup pictures also allows scientists to determine the chemical makeup of a particular pesticide.

Within the 100,000times magnification of a scanning electron microscope, some individual fungicide crystals look much like snowflakes resting on the leaf surface. Each chemical formulation has unique characteristics that make it

possible for scientists to identify the compound used. For example, the fungicide chlorothalonil has a distinct crystalline shape. Another type of fungicide, copper hydroxide, appears as small granules. Such knowledge helps scientists determine what specific chemicals are reaching intended targets.

To capture a picture of the object

being viewed, scientists use a type of x-ray analysis and digital imaging software built into the EBA equipment. This allows them to get clear, sharp photographs of individual chemicals and store them on a computer disk just like any other computer file.

"Digital imaging is safer, more efficient, and less expensive than conventional photographic film

CRAIG TAPAN / CHARLES KRAUSE (K7909-1)

Scanning electron micrograph of a chlorothalonil fungicide crystal. Magnified about 4000x.

processing," says Krause. "The process uses no toxic chemicals that present disposal problems. And we can use this digital image in a variety of ways, either to analyze or archive samples or to send them as electronic mail over the Internet to other scientists."

The development and use of EBA has evolved along with computers,

Krause says. It improves scientists' ability

to evaluate pesticides at the point of delivery. This is important because of increasing concern over their impact on the environment.

Traditional residue analysis targets one or two different aspects of the chemical. Electron beam analysis can directly detect the whole spectrum of chemical elements present in the residue.

"Our goal is to ensure that all of

the control agent reaches the target surface not the soil, the worker, or the environment. We want all of the control agent to go where it is needed. This is a key step in integrated pest management strategies," says Krause.—By Dawn Lyons-Johnson, ARS.

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